Remarks/Arguments

Upon entry of the foregoing amendments, Claims 30, 31, 38, 39, 43, 44 and 48 to 61 will be pending in this patent application. Claims 30, 31, 39 and 44 have been amended, without prejudice. Support for the amendment to Claims 39 and 44 is found throughout Applicants' specification such as, for example, at page 15, paragraph [0050] and pages 17 to 18, paragraphs [0058] to [0060]. Claims 40, 41, 42, 45, 46 and 47 have been canceled, without prejudice. Claims 48 to 61 are new. Support for new Claims 48 to 62 is found as follows:

New Claim	Example Citation of Support
48, 55	Original Claim 19
49, 56	Page 12, ¶ [0044]
50, 57	Original Claim 21
51, 58	Page 12, ¶ [0044]
52, 59	Original Claim 22
53, 60	Example 1
54, 61	Page 15, ¶ [0051]

No new matter has been added.

The Action includes a rejection under 35 U.S.C. § 103(a). In view of the following remarks, reconsideration and withdrawal of the rejection are requested respectfully.

Discussion of the Rejection Under 35 U.S.C. § 103(a)

Claims 30, 31, 39 and 44 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. Patent No. 6,495,479 to Wu ey al. ("the Wu patent") in view of the article C. Waldfried, et al., "Single Wafer RapidCuring™ of Porous Low-k Materials", IEEE

(2002), pp. 226-228 ("the Waldfried reference"). Applicants traverse the rejection respectfully because one of ordinary skill in the art at the time of the present invention would not have been motivated to combine the teachings of the cited references in such a way that would produce Applicants' claimed invention.

"A critical step in analyzing the patentability of claims pursuant to section 103(a) is casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field." *In re Kotzab*, 55 U.S.P.Q.2d 1313, 1316 (Fed. Cir. 2000). "The invention must be viewed not with the blueprint drawn by the inventor, but in the state of the art that existed at the time." *In re Dembiczak,* 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999) (quoting *Interconnect Planning Corp. v. Feil*, 227 U.S.P.Q. 543, 547 (Fed. Cir. 1985). To establish a *prima facie* case of obviousness, "the examiner must show reasons that the skilled artisan, confronted with the same problem as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed." *In re Rouffet*, 47 U.S.P.Q.2d 1453, 1458 (Fed. Cir. 1998).

The differences between Applicants' claimed invention and the Wu patent are significant. Importantly, the Wu patent does not teach or suggest (1) a hydrocarbon porogen having from 1 to 13 carbon atoms or (2) a porogen that is distinct from the structure-forming precursor. To the extent that the Wu patent provides any detail with respect to the specific types of porogens disclosed therein, the Wu patent teaches that its porogens are compounds or polymers that include "reactive groups" that will react with a silicon precursor (*i.e.*, structure-forming precursor) to form Si-O-R or Si-NHR bonds (see, col. 10, lines 39 to 43). Specific examples of such porogens are ***polymers*** (having reactive groups):

> Porogens which meet the above characteristics include those compounds and polymers which have a boiling point, sublimation temperature, and/or decomposition temperature (at atmospheric pressure) range, for example, from about 175°C to

> about 450°C, or in this range, to less than about 450°C. In particular embodiments, the boiling point, sublimation temperature, and/or decomposition temperature(s) of the porogen (at atmospheric pressure) are less than about 400°C, and in even more particular embodiments are less than about 300°C. In addition, poregens suitable for use according to the invention include those having a molecular weight ranging, for example, from about 100 to about 10,000 amu, and more preferably in the range of 100-3,000 amu.
>
> Broadly, porogens suitable for use in the processes and compositions of the invention include polymers, preferably those which contain one or more reactive groups, such as hydroxyl or amino. Advantageously, the molecular weights of selected polymers useful as porogens ranges, for example, from about 100 to about 10,000 amu. In particular embodiments, the molecular weight of the previously mentioned polymers range, from about 100 to about 3,000 amu. Within these general parameters, a suitable polymer porogen for use in the compositions and methods of the invention is, e.g., a polyalkylene oxide, a monoether of a polyalkylene oxide, an aliphatic polyester, an acrylic polymer, an acetal polymer, a poly(caprolatactone), a poly(valeractone), a poly(methyl methacrylate), a poly (vinylbutyral) and/or combinations thereof. When the porogen is a polyalkylene oxide monoether, one particular embodiment is a C_1 to about C_6 alkyl, e.g., polyethylene glycol monomethyl ether, or polypropylene glycol monomethyl ether

(*see*, col. 11, lines 8 to 39); or ***reactive organic compounds*** such as, for example, 1-adamantanol, 2-adamantanol, 1-adamantanamine, 4-(1-adamantyl)phenol, 4,4'-(1,3-adamantanediyl)diphenol, a-D-cellobiose octaacetate, and cholesterol (*see*, col. 11, lines 40 to 47). Because such compounds include atoms ***other than carbon and hydrogen***, they are ***not hydrocarbons***.

Moreover, the Wu patent teaches that purpose of the reactive groups is to ***react*** with the silicon precursor (*i.e.*, structure-forming precursor) ***to form one molecule***, which will allegedly minimize the chance of phase separation between the porogen and the silicon precursor:

> Preferrably, the porogen has reactive groups, such as hydroxyl or amino. The reactive groups will react with the silicon

> precursor to form Si--O--R or Si--NHR bonds ... ***These bonds will minimize the chance of phase separation between silicon monomer and porogen during film deposition (spin coating)***; minimal phase separation will lead to the best possible film appearance and thickness uniformity, and also minimize the pore size and distribution in the final film. Optionaly the porogen may have more than one reactive group of the same or different function (e.g., one or more of --OH and/or (--NH_2, etc.). Simply by way of example, such groups are believed to form a covalent linkage between a porogen and the Si component of the resulting film in the form of Si--O--C or Si--N--C linkages

(col. 10, lines 39 to 54) (emphasis added) (*see, also*, the Examples wherein the silicon precursor/porogen mixture undergoes a condensation reaction in the presence of water). Thus, because the Wu patent teaches that its porogens are not hydrocarbons, but rather include reactive groups (that include atoms that are other than carbon and hydrogen), the Wu patent does not disclose Applicants' recited porogen, *i.e.*, a hydrocarbon compound having from 1 to 13 carbon atoms. Moreoever, because the Wu patent teaches that its porogens react with the silicon precursor ***when mixed***, the Wu patent does not disclose a mixture of a structure-former precursor and a pore-former precursor wherein the pore-former precursor is ***distinct*** from the structure-former precursor as is recited by Applicants' claims. Thus, for at least these reasons, reconsideration and withdrawal of the rejection in view of the Wu patent in combination with the Waldfried reference are requested respectfully.

Claims 30 and 31 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over U.S. patent application Publication No. 2001/0055891 to Ko et al. ("the Ko publication") in view of the Waldfried reference. Applicants traverse the rejection respectfully because one of ordinary skill in the art at the time of the present invention would not have been motivated to combine the teachings of the cited references in such a way that would produce Applicants' claimed invention.

The differences between Applicants' claimed invention and the Ko publication are significant. Like the Wu patent, the Ko publication does not teach or suggest (1) a

hydrocarbon porogen having from 1 to 13 carbon atoms or (2) a porogen that is distinct from the structure-forming precursor. The Ko publication teaches that its porogen "is an organic molecule with a silyl group, preferably at the end" (*see* page 3, paragraph [0036]). The Ko publication is also clear that, in addition to the silicon atom, the porogen also includes a reactive/functional group:

> The pore-forming material is an organic molecules with a silyl group, preferably at the end. The organic part of the pore-forming material can be any organic aliphatic and/or aromatic hydrocarbon ***containing organic linkage groups that can be decomposed at 200 ~ 500°C***, such as ***ether*** containing organic molecule, ***ester*** containing organic molecules, ***amide*** containing organic molecules, ***carbonate*** group containing organic molecules, ***carbamate*** group containing organic molecules, ***anhydride*** group containing organic molecules, ***amine*** group containing organic molecules, ***enamine*** group containing organic molecules, ***imine*** group containing molecules, ***azo*** group containing organic molecules, ***thio-ether*** group containing organic molecule, ***sulfone*** group containing organic molecules, ***sulfoxide*** group containing organic molecules, ***isocyanate*** group containing organic molecules, ***isocyanurate*** group containing organic molecules, ***triazine*** group containing organic molecules, ***acid*** group containing organic molecules, ***epoxy*** group containing organic molecules, and the like. Organic linkage groups may exist in linear chain and/or cyclic structure. The organic part of the component (b) may contain one functional linkage group or in combination of two or more thereof. The sillane part of the component (b) has at least one functional group to react with the component (a). The preferred functional groups are alkoxy (methoxy, ethoxy, propoxy etc.), acyloxy (such as acetoxy), hydroxyl, or halide (such as chlorine)

(*see*, page 3, paragraph [0036]) (emphasis added). Thus, like that described above with respect to the Wu patent, the porogens of the Ko publication are ***not*** hydrocarbons having 1 to 13 carbon atoms as recited in Applicants' claims because the disclosed porogens ***include a silicon atom***.

Moreover, the Ko publication clearly teaches that the disclosed porogens are also ***attached*** to the structure-forming component:

> As the component (b) a pore-forming material used in the present invention is radiation decomposable or preferably thermally decomposable. The radiation decomposable small molecules decompose upon exposure to radiation; e.g. ultraviolet, x-ray, electron beam or the like. ***The thermally decomposable small molecules used as a pore-forming material having at least one silyl functional group at the end, so that a pore forming material can be connected by a covalent bonding with the component (a)***. The pore-forming material component (b) may be mixed with partially hydrolyzed condensate prepared from the component (a), or it can be added when preparing a partially hydrolyzed condensate of the component (a). The pore-forming material is an organic molecules with a silyl group, preferably at the end

(*see*, page 3, paragraph [0036]) (emphasis added). Paragraph [0037] further confirms that the porogen disclosed by the Ko publication is connected to the structure-forming component and that a raction occurs when the components are together in the presence of water and a catalyst:

> The ***cross-linking reaction*** between the component (a) and the component (b) may take place in the state of the solution or during the state of forming the coating film. In present invention, a component (a) or a mixture of component (a) and (b) can be partially hydrolyzed and condensed in an organic solvent after addition of water and catalyst. ***When the cross-linking reactions partially take place in the state of the solution to form uniformly distributed copolymer, the component (b) can be added to any state of hydrolysis and condensation of a component (a)***. The component (b) can be also added to partially hydrolyzed condensate of component (a) before forming the coating film

(emphasis added). Finally, the schematic diagram at page 5 of the Ko publication clearly illustrates pore formation by pyrolysis of Structural Formula I, which is silicon-containing molecule with a porogen attached thereto. Thus, like the Wu patent above, the Ko publication teaches that its porogens ***react*** with the silicon precursor ***when mixed***. Accordingly, the Ko publication does not disclose a mixture of a structure-former precursor and a pore-former precursor wherein the pore-former precursor is ***distinct*** from the structure-former precursor as is recited by Applicants' claims. Thus, for at least these reasons,

reconsideration and withdrawal of the rejection in view of the Ko publication in combination with the Waldfried reference are requested respectfully.

Claims 38 and 43 stand rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over the Ko publication in view of the Waldfried reference (or the Wu patent in view of the Waldfried reference), and further in view of U.S. patent application Publication No. 2003/0151031 to Li et al. ("the Li publication"). Since, as discussed above, the combination of the Ko publication and the Waldfried reference (or the Wu patent in view of the Waldfried reference) does not teach or suggest the basic invention, even if the Li publication discloses the additional limitation of Applicants' dependent Claims 38 and 43 (*arguendo*), its combination with the Ko publication and the Waldfried reference (or the Wu patent in view of the Waldfried reference) still would not render obvious the claimed invention. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

Conclusion

Applicants believe that the foregoing constitutes a complete and full response to the Action of record. Applicants respectfully submit that this application is now in condition for allowance. Accordingly, an indication of allowability and an early Notice of Allowance are respectfully requested.

The Commissioner is hereby authorized to charge the fee required and any additional fees that may be needed to Deposit Account No. 01-0493 in the name of Air Products and Chemicals, Inc.

Respectfully submitted,

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